ENGINEERING CHANGE NOTICE

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1. ECN 640352

Proj. ECN

2. ECN Category (mark one) Supplemental ~~[X]~~ Direct Revision [X] Change ECN [] Temporary [] Standby [] Supersedure [] Cancel/Void []	3. Originator's Name, Organization, MSIN, and Telephone No. B.C. Simpson, LMHC, R2-12 373-5915	4. USQ Required? [] Yes [X] No	5. Date 8/8/97
	6. Project Title/No./Work Order No. Tank 241-C-202	7. Bldg./Sys./Fac. No. NA	8. Approval Designator NA
	9. Document Numbers Changed by this ECN (includes sheet no. and rev.) WHC-SD-WM-ER-477, Rev. 0B	10. Related ECN No(s). NA	11. Related PO No. NA

12a. Modification Work	12b. Work Package No.	12c. Modification Work Complete	12d. Restored to Original Condition (Temp. or Standby ECN only)
[] Yes (fill out Blk. 12b) [X] No (NA Blks. 12b, 12c, 12d)	NA	NA Design Authority/Cog. Engineer Signature & Date	NA Design Authority/Cog. Engineer Signature & Date

13a. Description of Change

13b. Design Baseline Document? [] Yes [X] No

Add Appendix C, Evaluation to Establish Best-Basis Inventory for Single-Shell Tank 241-C-202.

14a. Justification (mark one)

Criteria Change	[]	Design Improvement	[]	Environmental	[]	Facility Deactivation	[]
As-Found	[X]	Facilitate Const	[]	Const. Error/Omission	[]	Design Error/Omission	[]

14b. Justification Details

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities. As part of this effort, an evaluation of available information for single-shell tank 241-C-202 was performed, and a best-basis inventory was established. This work follows the methodology that was established by the standard inventory task.

15. Distribution (include name, MSIN, and no. of copies)

Central Files	A3-88	K. M. Hall	R2-12
DOE Reading Room	H2-53	K. M. Hodgson	R2-11
TCSRC	R1-10	R. T. Winward	H5-49
File	H5-49	J. H. Baldwin	R2-12
B. C. Simpson	R2-12		
M. J. Kupfer	H5-49		
M. D. LeClair (3)	H0-50		

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16. Design Verification Required	17. Cost Impact						18. Schedule Impact (days)	
	ENGINEERING			CONSTRUCTION				
[] Yes	Additional	[]	$	Additional	[]	$	Improvement	[]
[X] No	Savings	[]	$	Savings	[]	$	Delay	[]

19. Change Impact Review: Indicate the related documents (other than the engineering documents identified on Side 1) that will be affected by the change described in Block 13. Enter the affected document number in Block 20.

SDD/DD	[]	Seismic/Stress Analysis	[]	Tank Calibration Manual	[]
Functional Design Criteria	[]	Stress/Design Report	[]	Health Physics Procedure	[]
Operating Specification	[]	Interface Control Drawing	[]	Spares Multiple Unit Listing	[]
Criticality Specification	[]	Calibration Procedure	[]	Test Procedures/Specification	[]
Conceptual Design Report	[]	Installation Procedure	[]	Component Index	[]
Equipment Spec.	[]	Maintenance Procedure	[]	ASME Coded Item	[]
Const. Spec.	[]	Engineering Procedure	[]	Human Factor Consideration	[]
Procurement Spec.	[]	Operating Instruction	[]	Computer Software	[]
Vendor Information	[]	Operating Procedure	[]	Electric Circuit Schedule	[]
OM Manual	[]	Operational Safety Requirement	[]	ICRS Procedure	[]
FSAR/SAR	[]	IEFD Drawing	[]	Process Control Manual/Plan	[]
Safety Equipment List	[]	Cell Arrangement Drawing	[]	Process Flow Chart	[]
Radiation Work Permit	[]	Essential Material Specification	[]	Purchase Requisition	[]
Environmental Impact Statement	[]	Fac. Proc. Samp. Schedule	[]	Tickler File	[]
Environmental Report	[]	Inspection Plan	[]		[]
Environmental Permit	[]	Inventory Adjustment Request	[]		[]

20. Other Affected Documents: (NOTE: Documents listed below will not be revised by this ECN.) Signatures below indicate that the signing organization has been notified of other affected documents listed below.

Document Number/Revision	Document Number/Revision	Document Number Revision
NA		

21. Approvals

	Signature	Date		Signature	Date
Design Authority			Design Agent		
Cog. Eng.	M. J. Kupfer *M J Kupfer*	8-19-97	PE		
Cog. Mgr.	K. M. Hodgson *K.M. Hodgson*	8-14-97	QA		
QA			Safety		
Safety			Design		
Environ.			Environ.		
Other	J. H. Baldwin *John Baldwin*	8/18/97	Other		

DEPARTMENT OF ENERGY

Signature or a Control Number that tracks the Approval Signature

ADDITIONAL

Tank Characterization Report for Single-Shell Tank 241-C-202

B. C. Simpson and R. T. Winward (Meier Associates)
Lockheed Martin Hanford Company, Richland, WA 99352
U.S. Department of Energy Contract DE-AC06-96RL13200

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Abstract: An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities. As part of this effort, an evaluation of available information for single-shell tank 241-C-202 was performed, and a best-basis inventory was established. This work follows the methodology that was established by the standard inventory task.

Janis Bishop 8-20-97
Release Approval Date

Release Stamp

Approved for Public Release

RECORD OF REVISION	(1) Document Number WHC-SD-WM-ER-477	Page X 1

(2) Title
Tank Characterization Report for Single-Shell Tank 241-C-202

CHANGE CONTROL RECORD

(3) Revision	(4) Description of Change - Replace, Add, and Delete Pages	Authorized for Release (5) Cog. Engr.	(6) Cog. Mgr. Date
0	(7) Initially released 08/07/95 on EDT-611434.	R.D. Schreiber	J.G. Kristofzski
RS 0-A	Incorporate per ECN-623846.	L.M. Sasaki	J.G. Kristofzski
		L.M. Sasaki	for JK 9/1/95
0-B RS	Incorporate per ECN-625693.	S.E. Kelly	J.G. Kristofzski
		S E Kelly	for JK 9/18/95
0C RS	Incorporate per ECN-640352	M.J.Kupfer	K.M. Hodgson
		M.J.Kupfer 8-19-97	K.M. Hodgson 8/19/97

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APPENDIX C

EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR SINGLE-SHELL TANK 241-C-202

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APPENDIX C

EVALUATION TO ESTABLISH BEST-BASIS INVENTORY FOR SINGLE-SHELL TANK 241-C-202

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities (Hodgson and LeClair 1996). As part of this effort, an evaluation of available information for single-shell tank 241-C-202 was performed, and a best-basis inventory was established. This work, detailed in the following sections, follows the methodology that was established by the standard inventory task. The following evaluation provides a best-basis inventory estimate for chemical and radionuclide components in tank 241-C-202.

C1.0 CHEMICAL INFORMATION SOURCES

Data sources for tank 241-C-202 include the following:

- Mean characterization results and inventory estimates from a core sample obtained in 1978 from tank 241-C-201 (Horton 1978). The sample had limited information collected from it, and no associated quality control assays; however, the principle assumption is that the C-200 series tanks contain basically the same waste types. Information for tank 241-C-201 serves as a basis for tank 241-C-202.

- Two auger samples were obtained from tank 241-C-202 for safety screening analysis in 1995 (Seciton 4.0 of this Tank Characterization Report [TCR]); however, the data obtained did not contribute to the chemical information available.

- The Hanford Defined Waste (HDW) model (Agnew et al. 1997a) provides tank contents estimates, derived from process flowsheets and waste volume records.

C2.0 COMPARISON OF COMPONENT INVENTORY VALUES

The 1978 sample-based inventory estimate for tank 241-C-201, adjusted to the volume of tank 241-C-202, and the tank 241-C-202 inventory estimate from the HDW model (Agnew et al. 1997a) are shown in Table C2-1 and C2-2. Each estimate, however, has a different density basis.

The HDW inventory estimates use a waste volume of 3.8 kL (1 kgal), and a waste density of 1.45 g/mL. The data-based inventory uses a volume of 3.8 kL (1 kgal), and a measured bulk density of 1.16 g/mL as bases. Because of the difference between the two estimates for the mass basis (relative percent difference = 22.2 percent), many differences between the sample-based and HDW model inventories are observed.

Estimates obtained from the two methods for most analytes vary by a factor of two or more. The chemical species in this section are reported without charge designation per the best-basis inventory convention.

Table C2-1. Data-Based and Hanford Defined Waste Model-Based Inventory Estimates for Nonradioactive Components in Tank 241-C-202.

Analyte	Data-based inventory estimate[a] (kg)	HDW model inventory estimate[b] (kg)	Analyte	Data-based inventory estimate[a] (kg)	HDW model inventory estimate[b] (kg)
Al	7.1	0	NO_3	146	5.48 E-06
Bi	NR	0	OH	22.0[c]	1,140
Ca	NR	0.613	Pb	NR	119
Cl	8.80	5.44	PO_4	650	0
Cr	0.59	1.30	Si	16.5	0
F	2.20	0	SO_4	NR	20.2
Fe	273	1,200	Sr	NR	0
K	1.76	10.8	TIC as CO_3	88.0	0.917
NH_3	NR	16.2	TOC	9.1	77.3
Na	119	159	U_{TOTAL}	0.292	0.013
Ni	35.3	41.1	Zr	NR	0
NO_2	4.41	156	H_2O (Wt%)	68.0	43.6
			Density (kg/L)	1.16	1.45

HDW = Hanford Defined Waste
NR = Not reported
[a] Derived from data for tank 241-C-201 (Horton 1978) and adjusted to the volume of tank 241-C-202
[b] Agnew et al. (1997a)
[c] Obtained from soluble portion only.

Table C2-2. Data-Based and Hanford Defined Waste Model-Based Inventory Estimates for Radioactive Components in Tank 241-C-202.

Analyte	Data-based inventory estimate[a] (Ci)	HDW model inventory estimate[b] (Ci)
^{137}Cs	34.0	0.554
^{90}Sr	180	30,800
$^{239/240}Pu$	10	16.53
Total α	45.9	NR

HDW = Hanford Defined Waste
NR = Not reported
[a] Derived from data for tank 241-C-201 (Horton 1978) and adjusted to the volume of tank 241-C-202
[b] Agnew et al. (1997a)
[c] Based on analyses of 1995 auger samples from tank 241-C-202 (Baldwin 1995).

C3.0 COMPONENT INVENTORY EVALUATION

The following evaluation of tank contents is performed in order to identify potential errors and/or missing information that would influence the sampling-based and HDW model component inventories. The types and volumes of solids accumulated in tank 241-C-202 reported by various authors is compiled in Tables C3-1, C3-2, and C3-3.

C3.1 CONTRIBUTING WASTE TYPES

The process history documents indicate the tank received mostly metal waste (MW) and Hot Semiworks/Strontium Semiworks (HS/SSW) waste while the tank was active. Tank 241-C-202 went into service in 1947, receiving metal waste through a diversion box (Agnew et al. 1997b). Metal waste sludge, which originated from uranium fuel dissolution in the bismuth phosphate process, was then sluiced from waste storage tanks, and the uranium in the waste was separated from fission products using a solvent extraction process based on tri-butyl phosphate. Most of the metal waste was removed from the tank in 1954 during the uranium recovery campaign. For the remainder of its service life, from 1955 to 1976, tank 241-C-202 received and stored HS/SSW (Agnew et al. 1997b). Because of the supporting information from process history, for purposes of this evaluation, the tank inventory is considered to be entirely HS/SSW.

Table C3-1. Waste Inventory of Tank 241-C-202 (Hanlon 1997).

Waste	Volume (kL)	Volume (kgal)
Sludge	3.8	1
Saltcake	0	0
Supernatant	0	0
Drainable Interstitial Liquid	0	0
Total Waste	3.8	1

Table C3-2. Expected Solids for Tank 241-C-202.

Reference	Waste Type
Anderson (1990)	MW, HS/SSW
SORWT Model (Hill et al. 1995)	HS/SSW
WSTRS (Agnew et al. 1997b)	HS/SSW
HDW Model (Agnew et al. 1997a)	HS/SSW

HDW = Hanford Defined Waste
HS/SSW = Hot Semiworks/Strontium Semiworks
MW = Metal waste
SORWT = Sort on radioactive waste type
WSTRS = Waste Status and Transaction Record Summary.

Table C3-3. Hanford Defined Waste Model Solids for Tank 241-C-202.

HDW solids layer	kL	kgal
HS/SSW	3.8	1
Total HDW Volume	3.8	1

HDW = Hanford Defined Waste, Agnew et al. (1997a)
HS/SSW = Hot Semiworks/Strontium Semiworks.

C3.2 EVALUATION OF PROCESS FLOWSHEET INFORMATION

Tank 241-C-202 contains a small amount of sludge. Technical flowsheet information for the HS/SSW stream is provided in Table C3-4. The comparative HDW is also provided in this table. The purpose of the comparison is to evaluate the accuracy, completeness, and reliability of the historical data.

Table C3-4. Technical Flowsheet and Hanford Defined Waste Compositions.

Analyte	Flowsheet HS/SSW[a] (mol/L)	HDW[b] HS/SSW (mol/L)
Ba	2.0 E-04	NR
Ca	0.0049	0.0049
Fe	0.03	0.07
Ce	0.0017	NR
Acetate	1.34	0.51
K	0.078	0.089
Na	4.9	2.21
OH	1.32	0.33
NO_3	2.1	1.08
Pb	0.034	0.0034
Rare Earths	0.0069	NR
Sr	5.0 E-04	NR

HDW = Hanford Defined Waste
HS/SSW = Hot Semiworks/Strontium Semiworks
NR = Not reported
[a] Hill et al. (1995)
[b] Agnew et al. (1997a).

C3.3 ENGINEERING EVALUATION OF TANK SAMPLE INFORMATION

An estimate of the waste inventory in tank 241-C-202 will be derived using information independent from the composition information contained in Horton (1978).

E3.3.1 Hot Semiworks/Strontium Semiworks Composition Estimate

Table C3-5 provides an estimate of the waste composition in tank 241-C-202 using the waste composition from data extracted from the flowsheet. In-tank photographs of tank 241-C-202 (Appendix A) show a dried and cracked surface of bright yellow material with some black powdery crust. No apparent moisture and no standing liquid are observed. The current differential scan calorimetry thermogravimetric analysis (DSC/TGA) information reflects this observation, with percent water measurements of 5 to 7 percent.

Table C3-5 also shows data for tank 241-C-202 based on a 1978 sampling event of tank 241-C-201 (Horton 1978). The results are for a single composite. Sample recovery appears to have been average to poor and only one riser was sampled. The core sample analysis were not documented to current quality control requirements; however, there is no reason to believe that the samples were not analyzed using good laboratory practice. The tank's process history, inspection of the available data, and visual observation of the current tank photos suggest that spatial heterogeneity may be significant for this tank.

The 1995 analysis was conducted on 2 auger samples. The results do not contain any relevant chemical species information, because only DSC/TGA, total organic carbon (TOC), and total alpha activity information was collected (Baldwin 1995).

C3.3.2 Basis For Sample Calculations Used In This Independent Evaluation

The total volume of waste that passed through these tanks is not well quantified and the amount of each contributing waste type is unknown. The HDW model inventory is based on assumptions regarding the physical behavior and composition of the waste types identified from process history, which have not been confirmed. This tank was recently sampled, but very little analytical data were collected; thus, that sampling event is not useful in this process (Baldwin 1995). Although process information is not complete, Hill et al. (1995) gives a generalized flowsheet for SSW/HS waste which was used to estimate selected analyte inventories. Horton (1978) is used extensively as the sample-based estimate, and Hanlon (1997) provides the volume basis.

C3.3.3 Assumptions

The assumptions and observations are based upon best technical judgement pertaining to parameters that can significantly influence tank inventories. These parameters include: (1) correct predictions of contributing waste types, (2) accurate predictions of model flowsheet conditions, fuel processed, and waste volumes, (3) accurate predictions of component solubilities, and (4) accurate predictions of physical parameters such as density, percent solids, void fraction (porosity), etc.

As necessary, the assumptions used can be modified to provide a basis for identifying potential errors and/or missing information that could influence either or both data- and model-based inventories. The simplified assumptions and observations use for predicting the inventory of several analytes in tank 241-C-202 are as follows:

1. Only HS/SSW introduced into tank 241-C-202 contributed to solids formation.

2. Radiolysis of NO_3 to NO_2 and any addition of NO_2 to the waste in tank 241-C-202 for corrosion control purposes are not accounted for in this independent assessment.

3. All Ba, Ca, Ce, Fe, Pb, and Sr from the HS/SSW flowsheet precipitated.

4. The currently accepted surveillance volume, the sample data concentrations, and sample data derived density were used in calculating the data-based inventories. The surveillance volume, the flowsheet concentrations (and other data, such as heat load estimates and 1995 sample data), and sample-based density was used in calculating the engineering assessment-based inventories. The HDW model-based inventories used its internal reference bases.

5. All acetate, K, and NO_3 were dissolved in the interstitial liquid. Al, Cr, PO_4, OH, and F partition between the liquid and solid phases.

6. Concentration of components in interstitial liquid is based on a void fraction of 0.82257 for HS/SSW. Those components were not lost with the evaporation of the supernatant and interstitial liquid.

Estimated component inventories from the evaluation of tank 241-C-201 (Schrieber et al. 1997) have been adjusted by a volume ratio to obtain an engineering evaluation-based inventory estimate for tank 241-C-202. This tank 241-C-202 engineering evaluation-based inventory estimate is compared with tank 241-C-202 data- and HDW-based inventories for selected components in Table C3-5. In addition to sample data, the engineering evaluation-based estimates also used surveillance data and data gathered from the 1995 sampling effort to derive estimates. Observations regarding these inventories are noted by component in the following text.

Table C3-5. Comparison of Selected Component Inventory Estimates for Tank 241-C-202 Waste. (2 Sheets)

Component	Engineering evaluation [a] (MT)	1978 data-based[b] (MT)	HDW estimate[c] (MT)
Ba	0.0045	NR	NR
Ca	0.032	NR	6.13 E-04
Ce	0.039	NR	NR
Acetate	0.246	NR	0.0939
Fe	0.27	0.273	1.20
K	0.009	0.0018	0.0108
Na	0.468	0.12	0.159
NO_3	0.405	0.145	0
Pb	1.15	NR	0.119
Sr	0.007	NR	0
H_2O (percent)	5.94[d]	68.0	43.6

Table C3-5. Comparison of Selected Component Inventory Estimates for Tank 241-C-202 Waste. (2 Sheets)

Component	Engineering evaluation [a] (MT)	1978 data-based[b] (MT)	HDW estimate[c] (MT)
Radionuclide	(Ci)	(Ci)	(Ci)
^{90}Sr	14,700[e]	180	30,800
^{137}Cs	NR	34.0	0.554
$^{239/240}Pu$	44.8	10	16.5

HDW = Hanford Defined Waste
MT = metric tons
[a] Schrieber et al. (1997)
[b] Horton (1978), adjusted for tank 241-C-203
[c] Agnew et al. (1997a)
[d] Based on thermogravimetric analyses of the 1995 auger samples (Baldwin 1995)
[e] Based on tank heat load (Kummerer 1995)
[f] Based on total alpha analyses for the 1995 auger samples (Baldwin 1995).

C3.5 DOCUMENT ELEMENT BASIS

This section compares the data-based estimate, the engineering assessment, and the inventory estimate calculated by the HDW model for selected analytes. Many of the differences observed between the estimates can be attributed to the differences in their respective mass bases. In other cases, the source term for the analyte in the waste type does not appear to be accurately or completely described. Several analytes such as aluminum, bismuth, chloride, chromium, fluoride, potassium, silicon, zirconium, and uranium are not principal process chemicals in the HS/SSW waste and are not expected to be present.

Barium. No comparison with the other estimation methods is possible because barium is not tracked by Agnew et al. (1997a), or reported in the 1978 sample data (Horton 1978). There is a trace amount of barium in this tank.

Nitrate. Wide variation is observed between the three estimates. The HDW estimated inventory is estimated to be zero. The engineering evaluation is three times larger than the data-based estimate, and both of these estimates are substantially above zero. The reason for the disagreement between the HDW estimate and the other two methods is not clear; however, it is probably the result of a source term discrepancy.

Calcium. The HDW estimated inventory is much smaller than the engineering estimate, but both indicate that calcium is a relatively small contributors to the waste.

Cerium. No comparison with the other estimation methods is possible because cerium is not tracked by Agnew et al. (1997a), or reported in the 1978 sample data (Horton 1978). Based on the assumption that all of the cerium from the HS/SSW flowsheet precipitated, there is a trace amount of cerium in this tank.

Acetate. Moderate variation is observed between the estimates. However, the engineering evaluation is approximately three times larger than the HDW model estimate. Current sample data from TOC and DSC results support a relatively high energetic organic content.

Iron. Wide variation is observed between the three estimates. The HDW estimated inventory is over four times the engineering evaluation. Because of the dependence of the concentration factor on iron sample and flowsheet data, there is no discrepancy between the engineering evaluation and sample data derived estimates. However, the differences between the cited flowsheet and the HDW flowsheet could account for the observed variation between the HDW estimate and the other estimates.

Sodium. There is considerable variation observed between the three estimates. The difference between the extreme values is approximately a factor of four.

Total Hydroxide. Once the best-basis inventories were determined, the hydroxide inventory was calculated by performing a charge balance with the valences of other analytes. In some cases, this approach requires that other analyte (e.g., sodium or nitrate) inventories be adjusted to achieve the charge balance. During such adjustments, the number of significant figures is not increased. This charge balance approach is consistent with that used by Agnew et al. (1997a).

Lead. Wide variation is observed between the two estimates. No sample data-based estimate is available. The HDW estimated inventory is almost 10 times smaller than the engineering evaluation. Most of this discrepancy is attributable to the order of magnitude difference between the engineering evaluation and HDW flowsheet concentrations. The flowsheet composition supports a modest to high amount of lead in the waste.

Strontium. No comparison with the other estimation methods is possible. Non-radioactive strontium is considered to be zero in Agnew et al. (1997a), and it is not reported in the 1978 sample data (Horton 1978). There is a trace amount of strontium in this tank.

Water. Wide variation is observed between the three estimates. The HDW estimated inventory and 1978 sample-based estimate are relatively close; however, the current sample data and tank observations support a much lower water content for the tank. The tank has dried over time, thus most of the water and other volatiles have been lost. Any partially or totally soluble analytes that were dissolved in the interstitial liquid have precipitated and are part of the waste solids.

Strontium-90. Wide variation is observed between the three estimates. The HDW estimated inventory is over twice as large as the engineering evaluation, based on the heat load in the tank derived from its dome temperature (Kummerer 1995). The engineering estimate is 82 times larger than the data-based estimate. Current sample data appear to be biased low because of waste heterogeneity.

Cesium-137. Wide variation is observed between the two estimates. No basis for an engineering estimate is available. The HDW estimated inventory is 60 times smaller than the data-based estimate. The sample data supports a modest amount of ^{137}Cs in the waste.

Total Alpha/Plutonium-239/240. Wide variation is observed between the three estimates. The 1978 sample data based estimate provides an extremely low value, over 3 orders of magnitude smaller than the HDW estimate. The HDW estimated inventory is almost 3 times smaller than the 1995 sample-based estimate. The 1995 sample data supports a relatively high inventory of an alpha emitter in the waste. This alpha emitter is conservatively assumed to be $^{239/240}Pu$, but there is no quantitative measurement of any of the individual alpha emitters.

C4.0 DEFINE THE BEST-BASIS AND ESTABLISH COMPONENT INVENTORIES

An effort is underway to provide waste inventory estimates that will serve as standard characterization source terms for the various waste management activities (Hodgson and LeClair 1996). As part of this effort, an evaluation of chemical information for tank 241-C-202 was performed, and a best-basis inventory was established. This work follows the methodology that was established by the standard inventory task.

The results from this evaluation support using the sample data-derived evaluation where possible as the best-basis value for tank 241-C-202 in most cases. However, because of the limited amount of data from both the samples and process history, the observed heterogeneity of the sample, and the wide variations in estimates that were derived from the three methods, there is no best source of estimates.

Best-basis inventory estimates for tank 241-C-202 are presented in Tables C4-1 and C4-2. The projected inventory is primarily based on a sample data-based evaluation of the tank; however, engineering estimates and HDW model values have been presented because of the incompleteness in the data. Both the engineering estimate values and data-based values are designated "E" in Table C4-1. The radionuclide inventories shown in Table C4-2 are based on the 1978 core sample results decayed to January 1, 1994, and Agnew et al. (1997a) HDW model estimates.

The inventory values reported in Tables C4-1 and C4-2 are subject to change. Refer to the Tank Characterization Database (TCD) for the most current inventory values.

Best-basis tank inventory values are derived for 46 key radionuclides (as defined in Section 3.1 of Kupfer et al. 1997), all decayed to a common report date of January 1, 1994. Often, waste sample analyses have only reported ^{90}Sr, ^{137}Cs, $^{239/240}$Pu, and total uranium, or less frequently, total beta and total alpha, while other key radionuclides such as ^{60}Co, ^{99}Tc, ^{129}I, ^{154}Eu, ^{155}Eu, and ^{241}Am, etc., have been infrequently reported. For this reason it has been necessary to derive most of the 46 key radionuclides by computer models. These models estimate radionuclide activity in batches of reactor fuel, account for the split of radionuclides to various separations plant waste streams, and track their movement with tank waste transactions.

These computer models are described in Kupfer et al. (1997), Section 6.1, and in Watrous and Wootan (1997). Model generated values for radionuclides in any of 177 tanks are reported in the HDW Rev. 4 model results (Agnew et al. 1997a). The best-basis value for any one analyte may be either a model result or a sample or engineering assessment-based result if available. No attempt has been made to ratio or normalize model results for all 46 radionuclides when values for measured radionuclides disagree with the model. For a discussion of typical error between model derived values and sample derived values, see Kupfer et al. (1997), Section 6.1.10.

Table C4-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-C-202 (Effective May 31, 1997). (2 Sheets)

Analyte	Total inventory (kg)	Basis (S, M, E or C)[1]	Comment
Al	7.1	E	
Bi	0	M	
Ca	32	E	
Cl	8.80	E	
TIC as CO_3	88.0	E	
Cr	0.59	E	
F	2.2	E	
Fe	273	E	
Hg	0	M	
K	10.8	M	
La	0	M	
Mn	0	M	
Na	468	E	
Ni	35.3	E	
NO_2	4.41	E	
NO_3	146	E	
OH	372	C	Calculated by change balance (Engineering estimate was 92 kg)
Pb	1,150	E	
PO_4	650	E	
Si	16.5	E	
SO_4	20.2	M	
Sr	0	M	
TOC	9.1	E	
U_{TOTAL}	0.292	E	

Table C4-1. Best-Basis Inventory Estimates for Nonradioactive Components in Tank 241-C-202 (Effective May 31, 1997). (2 Sheets)

Analyte	Total inventory (kg)	Basis (S, M, E or C)[1]	Comment
Zr	0	M	

[1]S = Sample-based
M = Hanford Defined Waste model-based, Agnew et al. (1997a)
E = Engineering assessment-based or tank 241-C-201 data-based
C = Calculated by charge balance; includes oxides as hydroxides, not including CO_3, NO_2, NO_3, PO_4, SO_4, and SiO_3.

Table C4-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-C-202, Decayed to January 1, 1994 (Effective May 31, 1997). (2 Sheets)

Analyte	Total inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{3}H	8.19 E-04	M	
^{14}C	0.00113	M	
^{59}Ni	0.423	M	
^{63}Ni	41.5	M	
^{60}Co	0.00119	M	
^{79}Se	0.00494	M	
^{90}Sr	14,700	E	From estimate of 1994-95 heat load
^{90}Y	14,700	E	Based on ^{90}Sr
^{93}Zr	0.0218	M	
^{93m}Nb	0.0184	M	
^{99}Tc	0.00795	M	
^{106}Ru	9.42 E-06	M	
^{113m}Cd	0.0562	M	
^{125}Sb	0.00457	M	
^{126}Sn	0.00788	M	
^{129}I	1.54 E-05	M	
^{134}Cs	4.42 E-06	M	
^{137}Cs	23.6	E	1978 sample data = 34 Ci
^{137m}Ba	22.3	E	Based on ^{137}Cs
^{151}Sm	18.5	M	
^{152}Eu	0.325	M	
^{154}Eu	0.189	M	
^{155}Eu	21.2	M	
^{226}Ra	3.68 E-05	M	
^{228}Ra	2.06 E-10	M	
^{227}Ac	1.80 E-04	M	
^{231}Pa	4.86 E-06	M	
^{229}Th	3.73 E-08	M	

Table C4-2. Best-Basis Inventory Estimates for Radioactive Components in Tank 241-C-202, Decayed to January 1, 1994 (Effective May 31, 1997). (2 Sheets)

Analyte	Total inventory (Ci)	Basis (S, M, or E)[1]	Comment
^{232}Th	2.69 E-13	M	
^{232}U	2.92 E-10	M	
^{233}U	7.68 E-12	M	
^{234}U	4.19 E-06	M	
^{235}U	1.76 E-07	M	
^{236}U	9.74 E-08	M	
^{238}U	4.16 E-06	M	
^{237}Np	2.41 E-05	M	
^{238}Pu	0.335	M	
^{239}Pu	14.2	M	
^{240}Pu	2.33	M	
^{241}Pu	24.2	M	
^{242}Pu	1.19 E-04	M	
^{241}Am	4.79	M	
^{243}Am	1.15 E-04	M	
^{242}Cm	0.00771	M	
^{243}Cm	4.22 E-04	M	
^{244}Cm	2.05 E-04	M	

[1]S = Sample-based
M = Hanford Defined Waste model-based, Agnew et al. (1997a)
E = Engineering assessment-based and data-based.

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C5.0 APPENDIX C REFERENCES

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